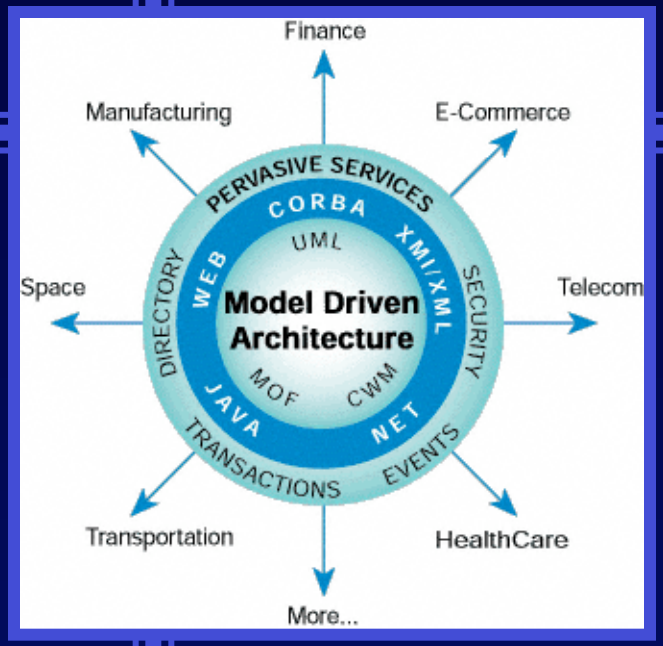

Introduction to OMG's Model Driven Architecture

Updated October 2002

Written and Presented by

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Object Management Group

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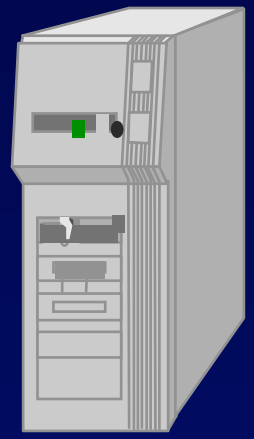
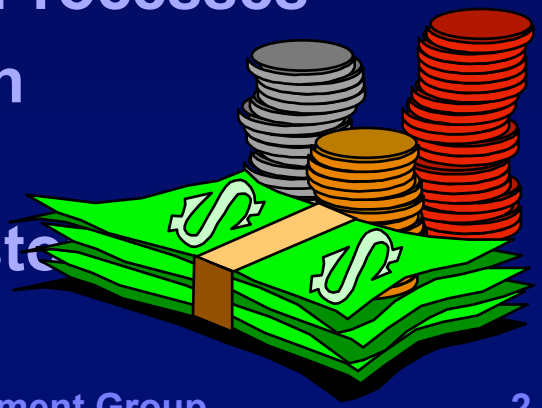
Enterprise IT Must Deal With

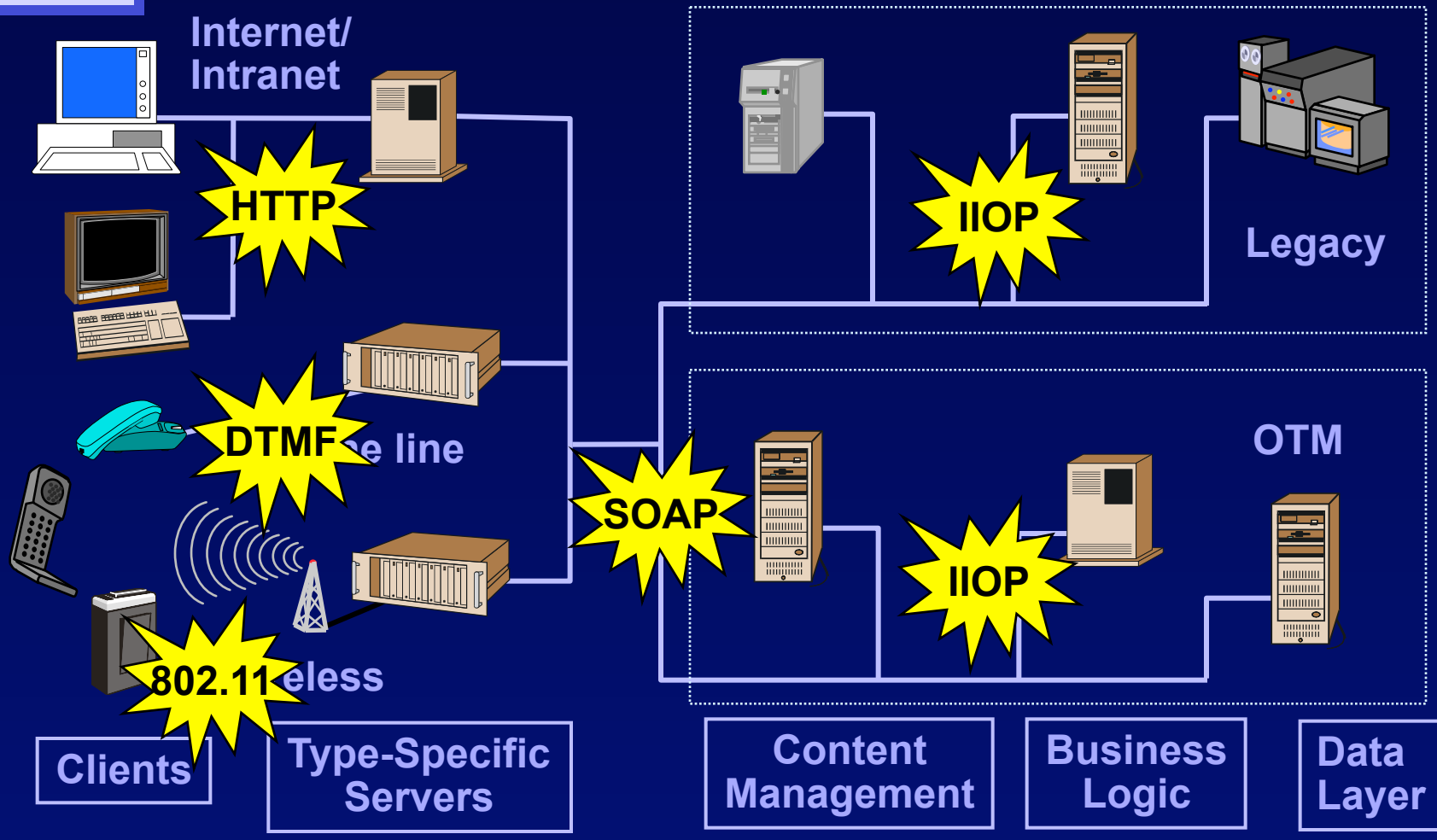
- **Technological Factors:**
  - Barriers to Interoperability/Integration
  - Development/Maintenance Obstacles
  - Evolving/Unstable Technology Suite

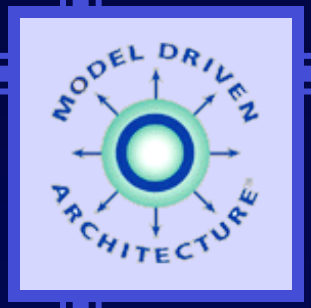


- **Business Factors:**
  - Defining/Meeting Business Requirements
  - Complex/Changing Business Processes
  - Shifting Enterprise/Application Boundaries
  - Semantic Integration with Custo Suppliers/Partners



Today's Architecture





From Design to Deployment

Modeling Environment:

- Data Model
- Appl Model
- Repos-itory

Applications

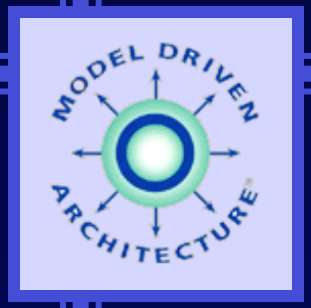
Domain Frameworks:

- Mfg: PDM
- Fin: Acctg

Distributed Infrastructure:

Platforms, Languages, Networks, Protocols, Middlewares, Messaging

Support for *All* your Business Computing



From Design to Deployment

Modeling Environment:

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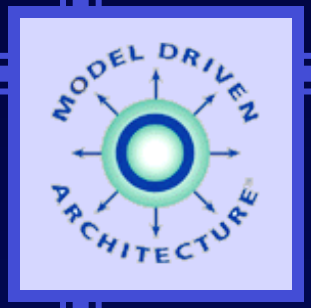
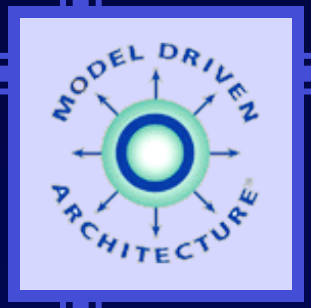


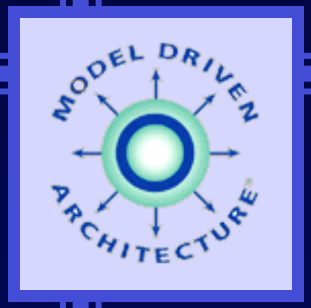
Why Focus on Modeling?

Because Modeling is the only way to ensure that enterprise IT systems deliver the functionality that a business requires, comprehensive and stable, yet able to evolve in a controlled manner as business needs change over time.



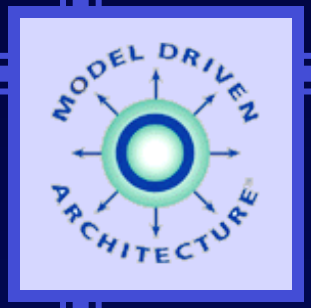
Why Focus on Modeling?

Models built in the Unified Modeling Language (UML) represent exactly what a business application - even a complex, multi-platform integrated application - can do, and record it with a clarity and stability that far exceeds that of the applications themselves.



Why Focus on Modeling?

Based on technology-independent representations of their business functionality and behavior, modeled applications last for decades and maximize IT return on investment.



OMG Modeling Support

- MOF: Meta-Object Facility
  - Integrated Repository
  - Standard MetaModel
- XMI: XML Metadata Interchange
  - Model & MetaModel Interchange
  - XML-Based Format, including DTDs
- Unified Modeling Language UML 1.4
  - World Standard for A&D
  - Representation for Structure, Dynamics, Deployment
- CWM: Common Warehouse Metamodel
  - Data Warehousing Integration
  - Record, Table formats; Data Loading & Transformation

What is the MOF?

- The MOF defines the dictionary of model elements, as an abstract model called a meta-metamodel
- This common dictionary enables model exchange from one tool to another
- The MOF also defines a standard distributed repository
- A necessary foundation for modeling

The MOF Defines…

- CLASSES, with Attributes and Operations at both Object and Class level
- ASSOCIATIONS support binary links between class instances
- PACKAGES are collections of related Classes and Associations
- DATATYPES represent non-object types as Parameters or Attributes
- CONSTRAINTS associate semantic restrictions with other elements

XMI: XML Metadata Interchange

- OMG-Standardized format for exchange of models (and meta-models)
- XML-based transport
- MOF-based schema for compactness without ambiguity
- Exchange UML models among tools and repository

The Metadata Problem

CWM Addresses a Problem Facing Every Enterprise:

- Many Databases
- Many Repositories
- Many Schemas Describing the “Same” Data
- Moving Data Requires Manual Schema Transformation

CWM Integrates your Data

- Integrates Existing Data Models
- Maps to Existing Schemas
- Supports Automated Schema Generation
- Supports Automated Database Loading
- The Basis for Data Mining and OLAP Across the Enterprise

Big Software Projects…

- are like Buildings – they have a structure with many interlocking parts
- You wouldn't contract to build a skyscraper without seeing plans first:
  - Elevations
  - Interior Views
  - Site Plan
  - Blueprints
  - Floor Plans
  - Structural Analyses
- Large Software Projects deserve the same treatment
- Better Time and Cost Estimates; Less Risk

UML – a *Graphic* Language for

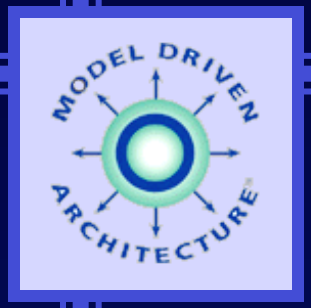
- Visualizing
  - Using the standardized graphic UML displays
- Specifying
  - Semantics to define
    - static structure
    - dynamic behavior
    - model organization
- Constructing
  - Map UML to Programming Environment and Generate some code Automatically
- Documenting
  - Every phase of lifecycle from analysis and design through deployment and maintenance

UML Diagrams

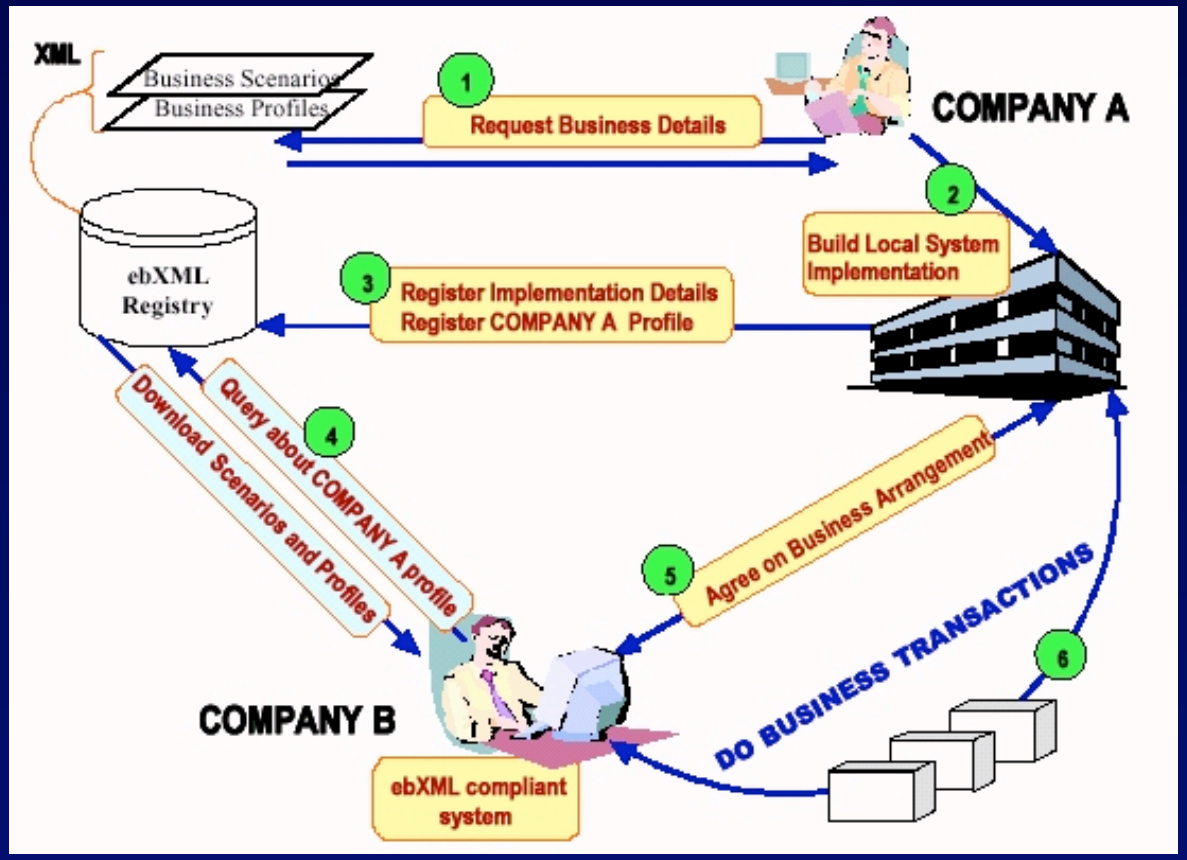
- Foundation: Structural Diagrams – static structure
  - Class Diagram
  - Component Diagram
  - Object Diagram
  - Deployment Diagram
- Behavior: Behavioral Diagrams – dynamic behavior
  - Use Case Diagram
  - Statechart Diagram
  - Sequence Diagram
  - Activity Diagram
  - Collaboration Diagram
- Model Management Diagrams – organization
  - Packages
  - Models
  - Subsystems

UML Summary

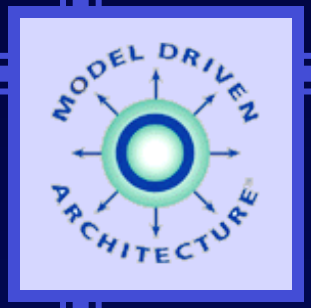
- The Way the World Does Modeling, with Universal Industry Support
- Flexible Representation of Static Structure and Dynamic Behavior
- Diagrams Map to Formally Defined Underlying Model
- Usable by Every Methodology
- An OMG Standard
- Widely Supported Upgrade to UML 2.0 Now Underway



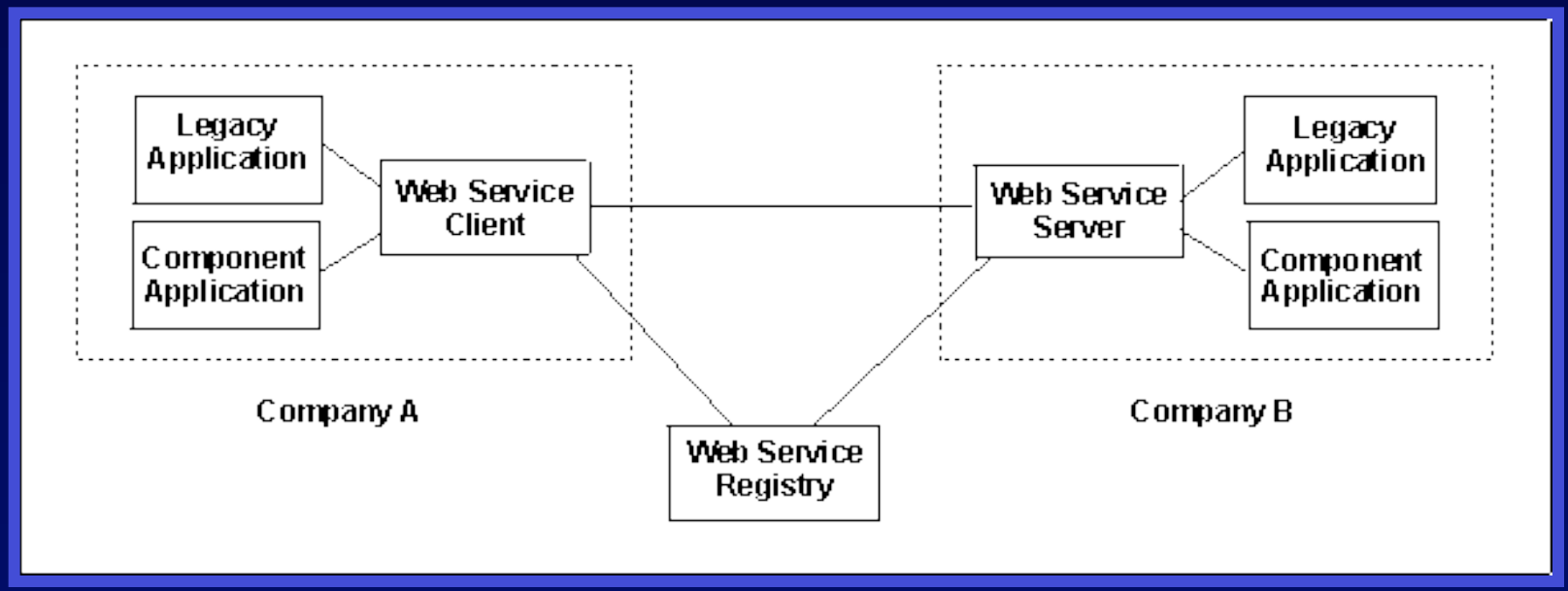
New "Next Best Thing": Web Services



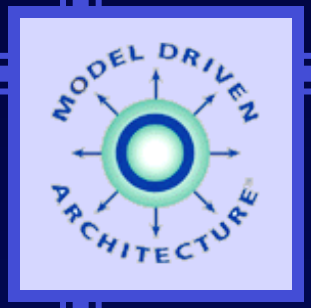
Clipped from the ebXML Technical Architecture



Web Services are EAI!

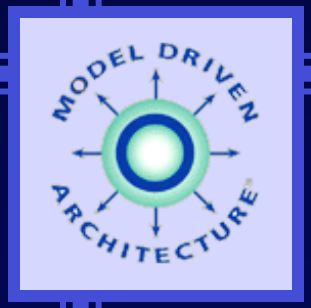


- For B2B, both client and server must connect to many legacy applications on many legacy middleware platforms



What is the Model Driven Architecture™?

- A New Way to Specify and Build Systems
  - Based on Modeling and UML
  - Supports full lifecycle: A&D, implementation, deployment, maintenance, and evolution
  - Builds in Interoperability and Portability
  - Lowers initial cost and maximizes ROI
  - Applies directly to the mix of hardware and software that you face:
    - Programming language
    - Operating system
    - Network
    - *Middleware*

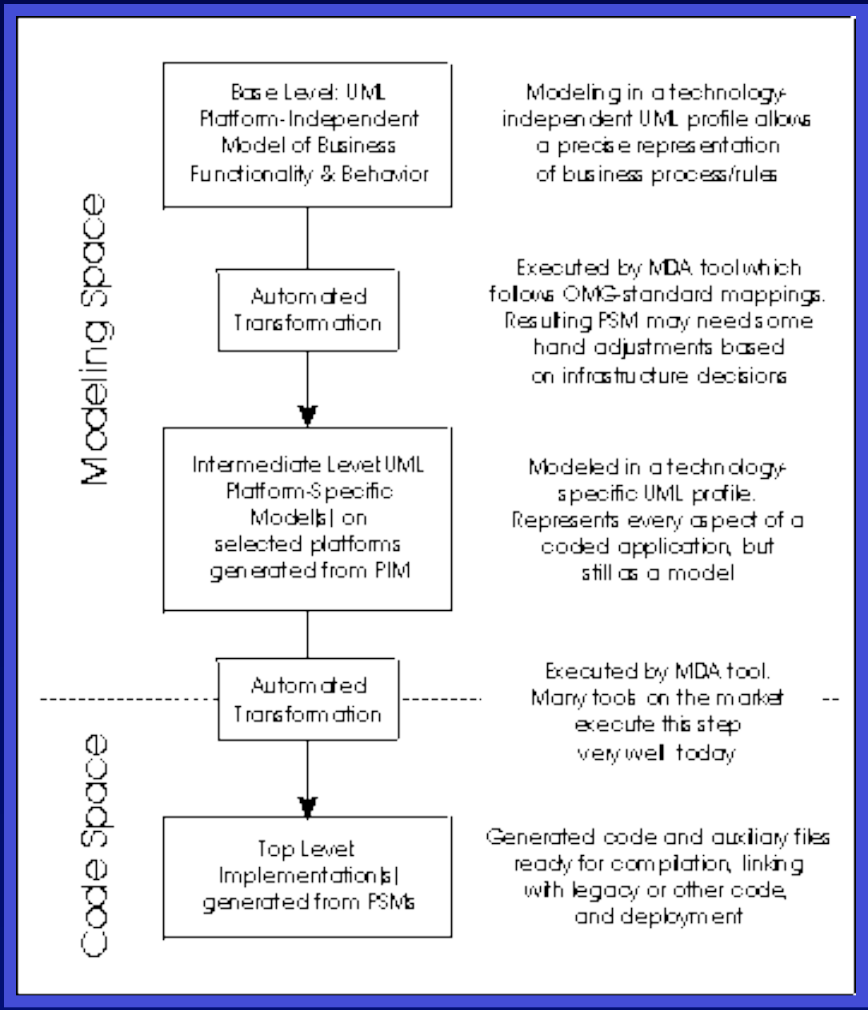


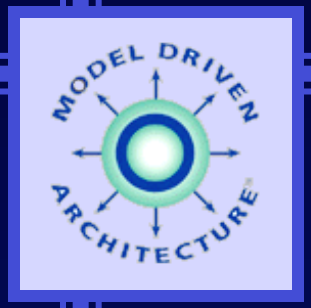
Waves of Middleware Platforms

- CORBA®: Vendor, OS- Independent Middleware
- But not the *only* MW. For example:
  - Java/EJB
  - XML/SOAP
  - C#/.Net
  - Web Services (of course)
  - What will be Next Best Thing?
- Need to preserve value of Software Investment as the infrastructure landscape changes around it
- Need Portability and Interoperability across HW & SW vendor, operating system, programming language, network, and now *middleware* too!

MDA: Designed for Business

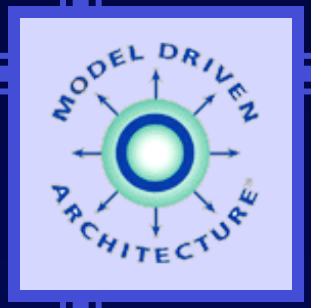
- Structure is a Spectrum progressing from Modeling at the Top to Code development at the bottom





A Sensible Structure:

- Input and Investment concentrate at the business zone at the top
- Automated tools take over coding IT infrastructure towards the bottom
- Code draws from libraries written and assembled by the industry's best minds
- Remote invocations, hard to program but hardly creative, are programmed by machines, not people

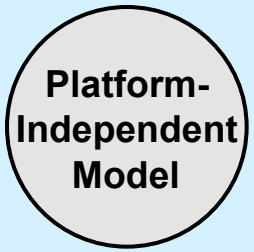


Building an MDA™ Application

Start with a ***Platform-Independent Model*** (PIM), in UML and defined at multiple levels.

Base level PIM represents *only* business functionality and behavior, undistorted by technology details.

Next level adds, e.g., general aspects of components or asynch comms.



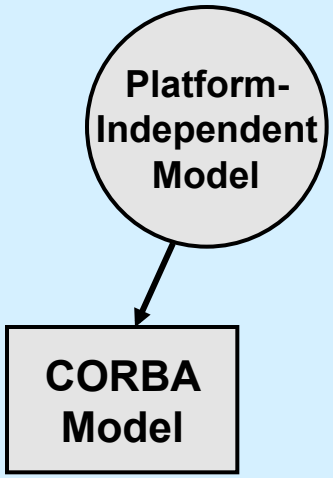
A Detailed Model, stating Pre- and Post-Conditions in OCL, and Semantics in Action Language

Platform-Specific Model

MDA tool applies an OMG™-standard Mapping – formally, a UML Profile – to generate a *Platform-Specific Model* (PSM) from the PIM.

This model, like the PIM, will be very detailed.

This step may require hand-editing, depending on the tool and environment

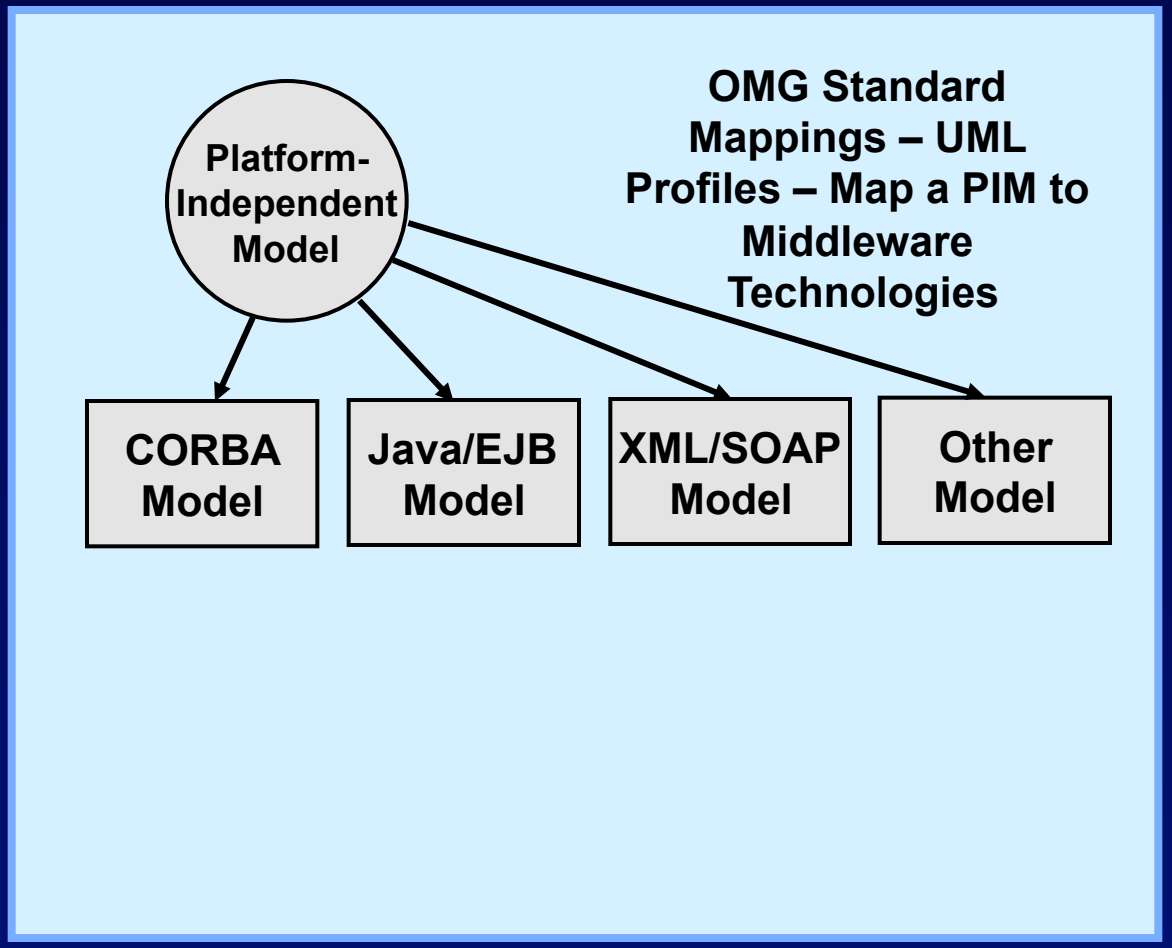


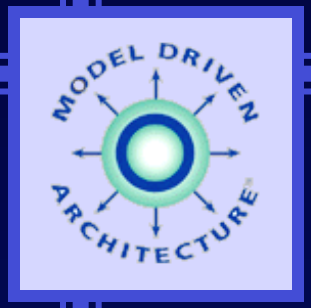
OMG Standard Mappings – UML Profiles – Map a PIM to Middleware Technologies

Multiple Middleware Models

OMG will standardize – and MDA tools will implement – mappings to multiple middleware platforms.

Each mapping – formally, a UML *profile* – defines the route from an application's single PIM to a PSM on a target platform.

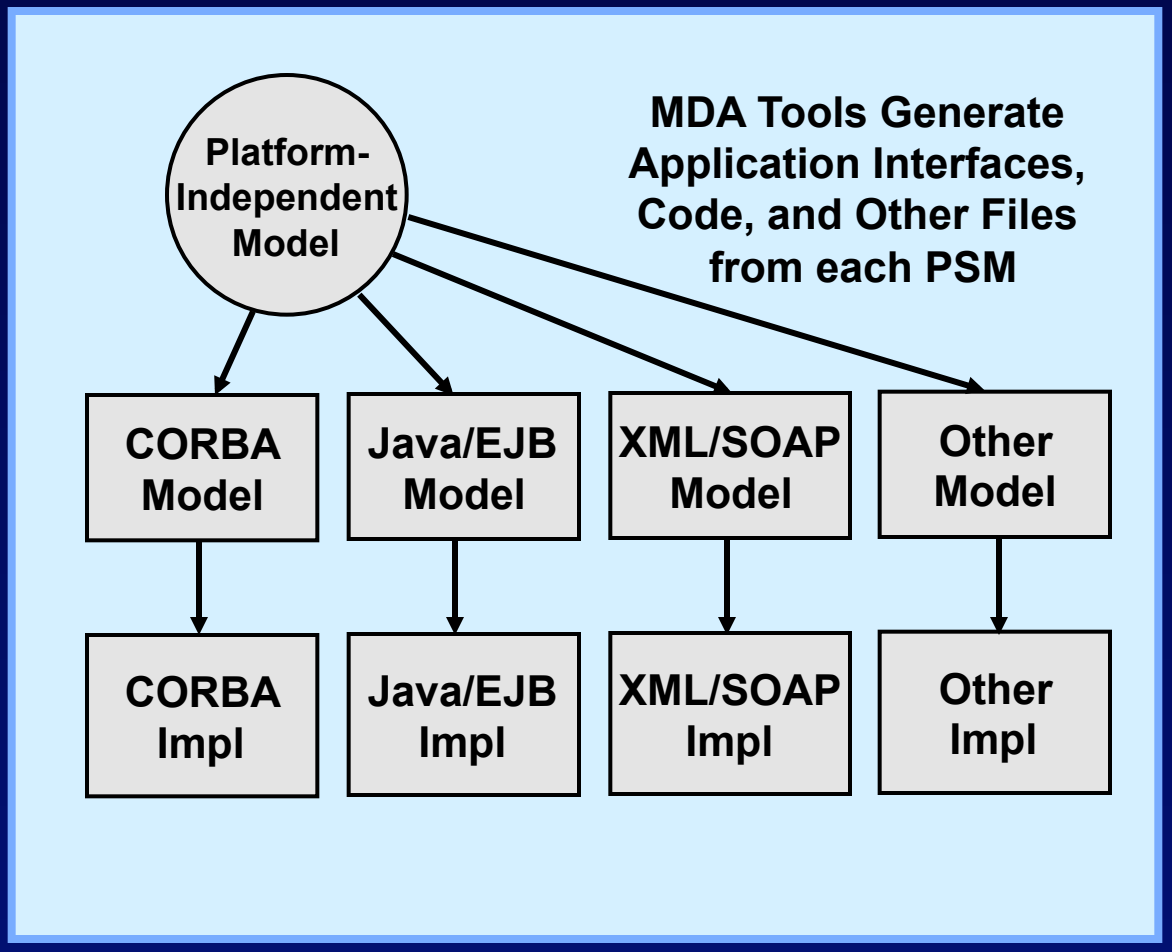




Generate Implementation

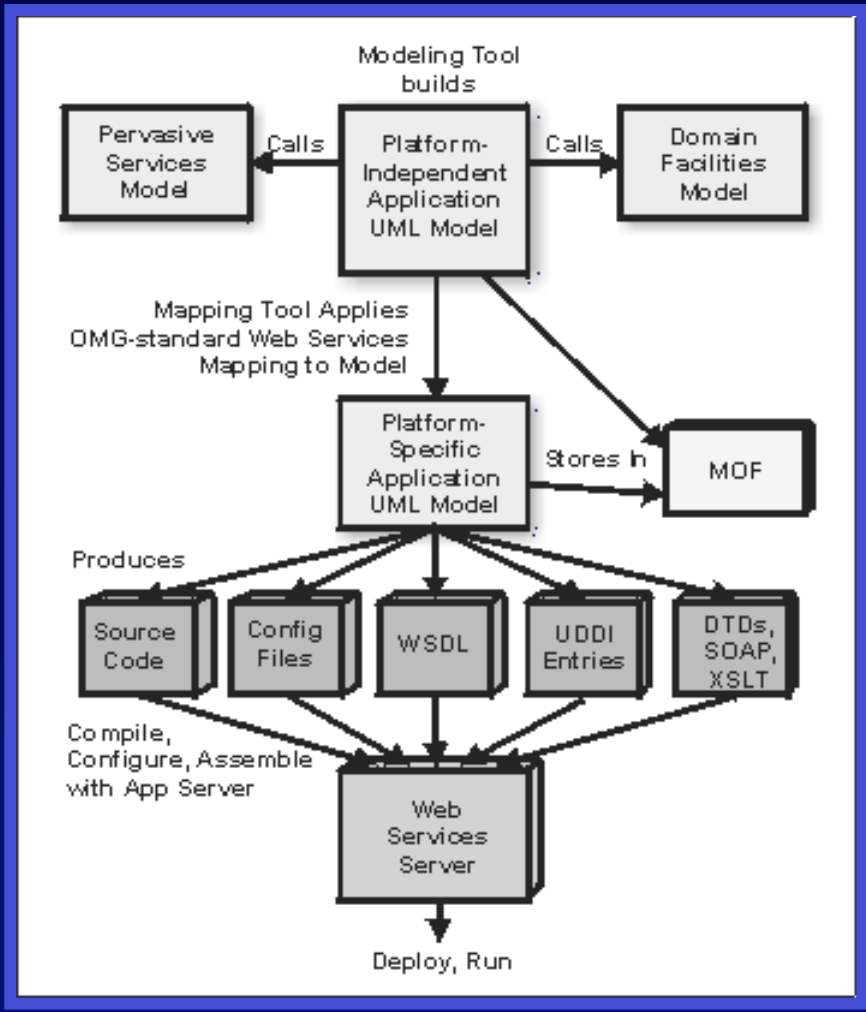
A PSM contains basically the same information as an application, but expressed in UML instead of code.

MDA development tools can generate all or most of an application from a PSM: interfaces, templates, configuration files, more.

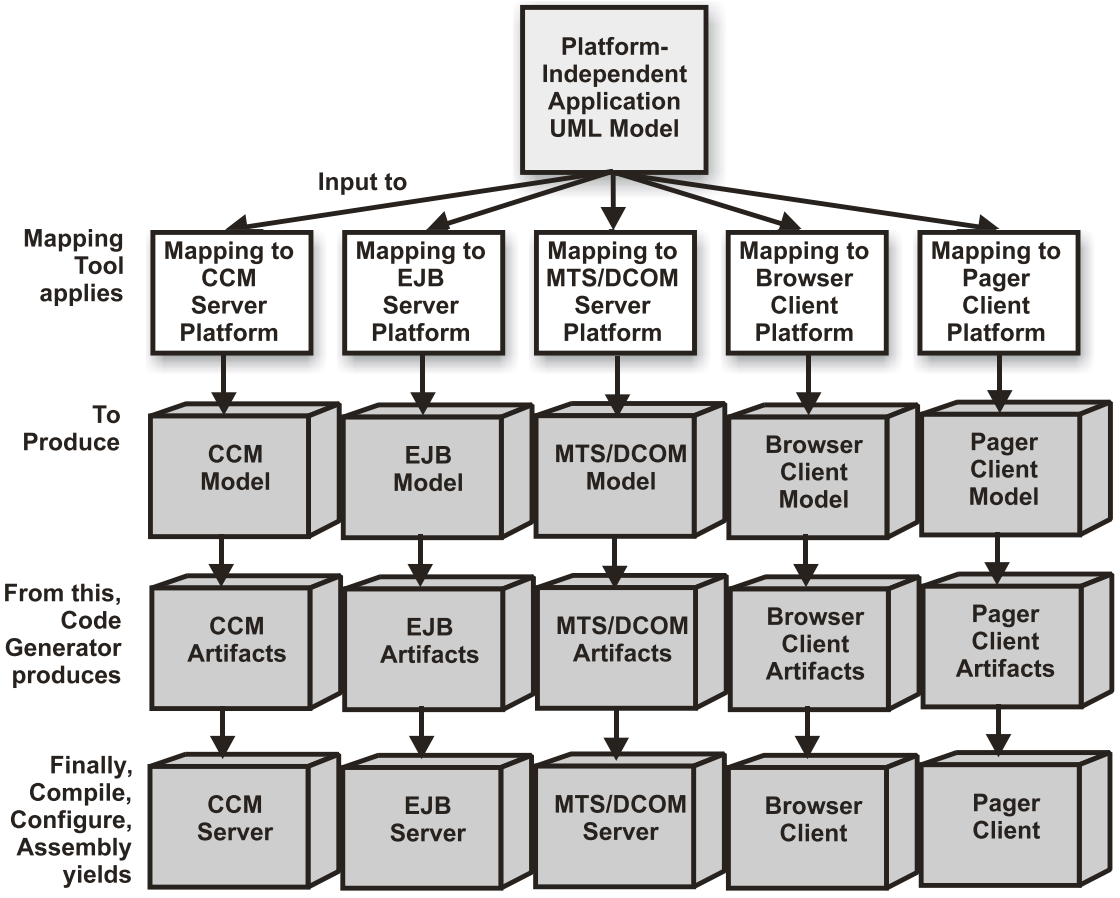


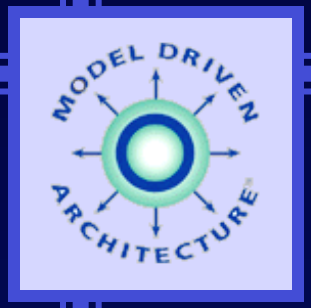
Services & Facilities in MDA

- Bring in Services (Naming, Directory) & Facilities as you Model
- Produce *All* needed file types in final generation step



Targeting Multiple Platforms

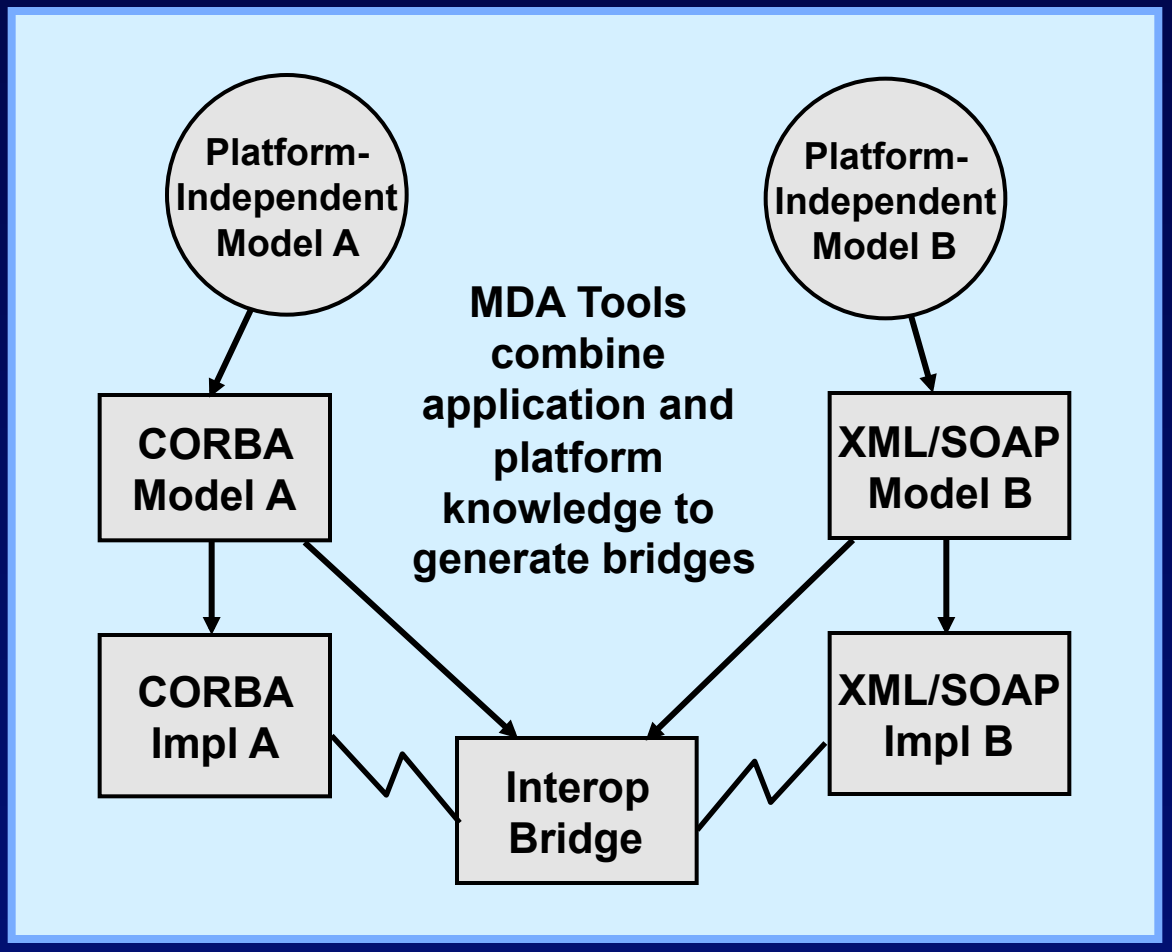




MDA Applications Interoperate

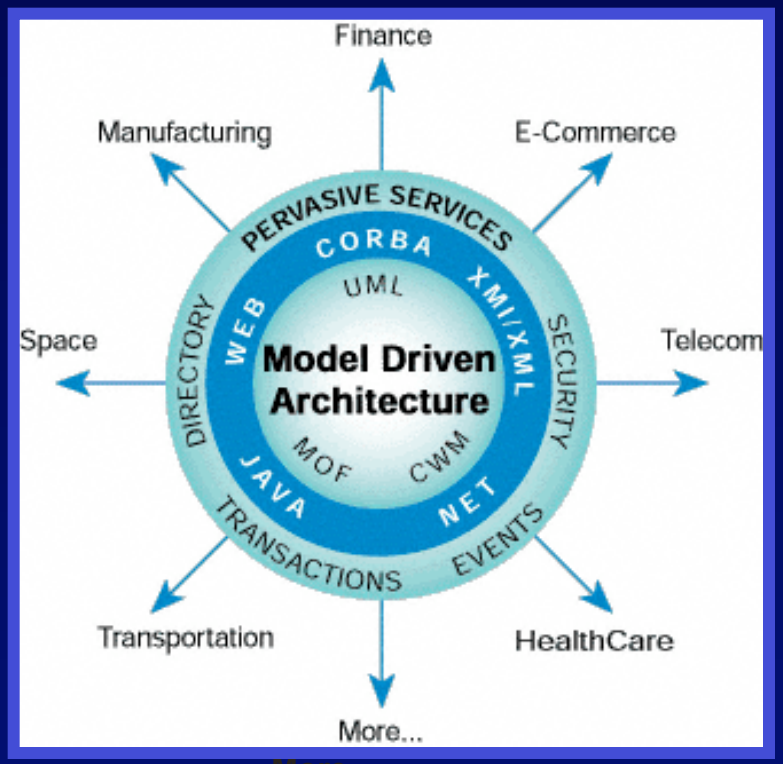
MDA Tools will also generate cross-platform bridging code connecting either instances of a single MDA application, or one application to another.

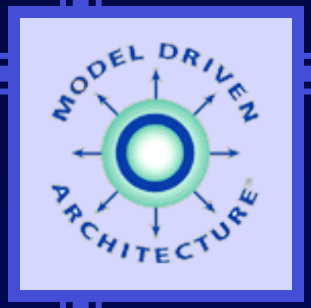
Standard *Pervasive Services* – directory, security, more – will also be accessed through bridging code where necessary.



MDA in Industry Standards

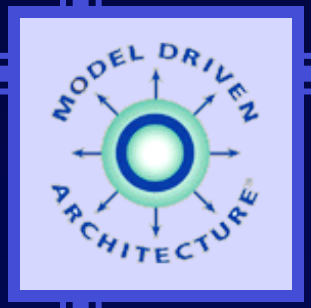
- OMG (and other) Task Forces standardize Domain (Industry-Specific) Facilities as PIMs.
- With implementations on multiple platforms, no technology or platform barriers prevent widespread adoption and use.
- Interoperate cross-platform with other standard applications.
- Both PIM and set of PSMs and interface code – on *every* mapped platform – become OMG standards.





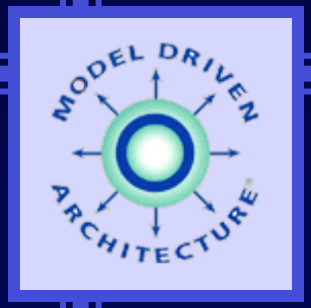
MDA Specifications

- MDA Architecture (Adopted Sept 2001)
- UML 1.4 (complete) and 2.0 (in process)
- UML Profiles:
  - Profile for EDOC (complete)
  - Profile for EAI (complete)
  - Profile for CORBA (complete)
  - Profile for EJB (in JCP)
- Support from XMI, CWM (complete)
- Pervasive Services (coming)
- Domain Specifications



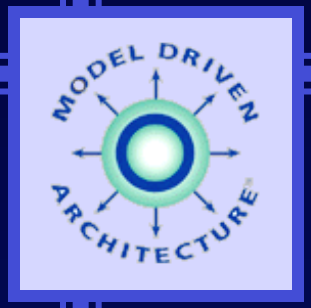
MDA Benefits

- Full support throughout the application life-cycle
- Stable, model-based approach maximizes SW ROI
- Technology-independent representation of business rules
- Reduced costs from beginning to end
- Reduced development time for new applications
- Optimized technical behavior - scalability, robustness, security – via generated code
- Smooth integration across middleware platform boundaries
- Rapid inclusion of emerging technologies into existing systems



MDA Links

- MDA Central:
  - http://www.omg.org/mda
- Executive overview:
  - http://www.omg.org/mda/executive_overview.htm
- OMG White Papers:
  - http://www.omg.org/mda/papers.htm
- FAQ:
  - http://www.omg.org/mda/faq_mda.htm
- Specifications:
  - http://www.omg.org/mda/specs.htm
- Products and Vendors:
  - http://www.omg.org/mda/products_success.htm
- Presentations:
  - http://www.omg.org/mda/presentations.htm
- Contact OMG:
  - Email info@omg.org or siegel@omg.org



Section 7: Overview of OMG

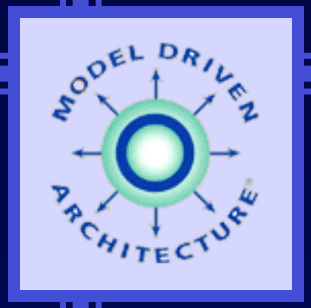
- OMG Organization
- Who belongs to OMG?
- Creating a new OMG specification

OMG: Background

- World's largest software consortium.
- Founded April 1989 - Twelve Years Old
- Small staff (25 full time); no internal development. Offices in U.S.A., Germany, Japan, U.K, Australia, India
- Home of the Model Driven Architecture and MDA-Based Standards, Maximizing IT ROI by Extending Software and Infrastructure Lifetime Across Technology Transitions

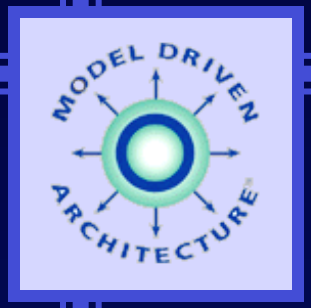
Worldwide Scope

Alcatel	Daimler-Chrysler	General Dyn IS	NASA Goddard	SAP AG
ACORD	Deere & Co.	HP	NEC	Siemens
Bank of America	DMSO	Hitachi	Nippon T&T	Sprint
Bayer	Eastman Kodak	IBM	NIST	Sun
BEA Systems	EDS	IONA	Nokia	Telelogic
Boeing Aircraft	Ericsson	Lockheed Martin	NSA	Unisys
Borland	Finnish Defence	Lucent	Oracle	Vertel
Bristol-Myers	Ford Motor	MedicAlert	PrismTech	W3C
Compaq	Fujitsu	Mitre	Rational SW	WebMD
CA	GCHQ	Motorola	Raytheon	Workflow Mgmt



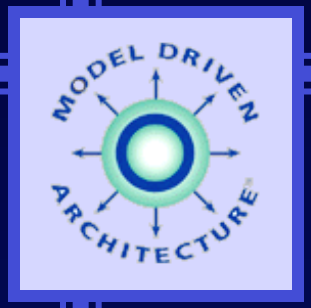
Meetings, Meetings!

- OMG Specifications are adopted at our meetings
- Held Five times a year, at member companies' sites around the world
- Lasts a week and attracts over 500 people
- Every subgroup meets; up to 30 simultaneous sessions on some days
- Dates, locations on the web at http://www.omg.org/techprocess/meetings/upcoming.html
- You're invited to come as an observer! Just let me know (email: info@omg.org)



Adoption Process

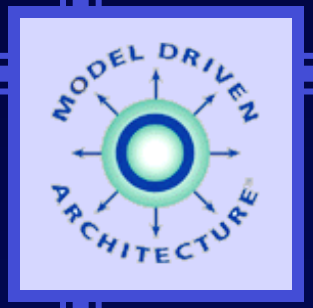
- RFI (Request for Information) to establish range of commercially available software.
- RFP (Request for Proposals) to gather explicit descriptions of available software.
- Letters of Intent to establish corporate direction.
- Task Force and End User evaluation & recommendation; simultaneous Business Committee examination.
- Board decision based on TC, End User, and BC recommendations.



Availability

Innovative approach for selection of standard interfaces to adopt:

1. OMG adopts & publishes MDA PIMs and PSMs, and Implementation Interface Specifications.
2. Implementations of the Interface Specifications must be available commercially from OMG Platform, Domain, or Contributing member.
3. MDA PIMs and PSMs, and Interface Specifications, are freely available to members and non-members alike.
4. MDA PIMs and PSMs, and Interface Specifications chosen from existing products in a competitive selection process.



Contact OMG:

- Web:
  - Home page: http://www.omg.org
  - MDA: http://www.omg.org/mda
  - About OMG: http://www.omg.org/gettingstarted/gettingstartedindex.htm
  - Tutorial: http://www.omg.org/gettingstarted/index.htm
- Email: siegel@omg.org or info@omg.org
- Telephone: 781-444-0404